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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 : B41L 25/12, 25/16	A1	(11) International Publication Number: WO 86/ 02319
		(43) International Publication Date: 24 April 1986 (24.04.86)

(21) International Application Number: PCT/US85/01971

(22) International Filing Date: 9 October 1985 (09.10.85)

(31) Priority Application Number: 660,008

(32) Priority Date: 11 October 1984 (11.10.84)

(33) Priority Country: US

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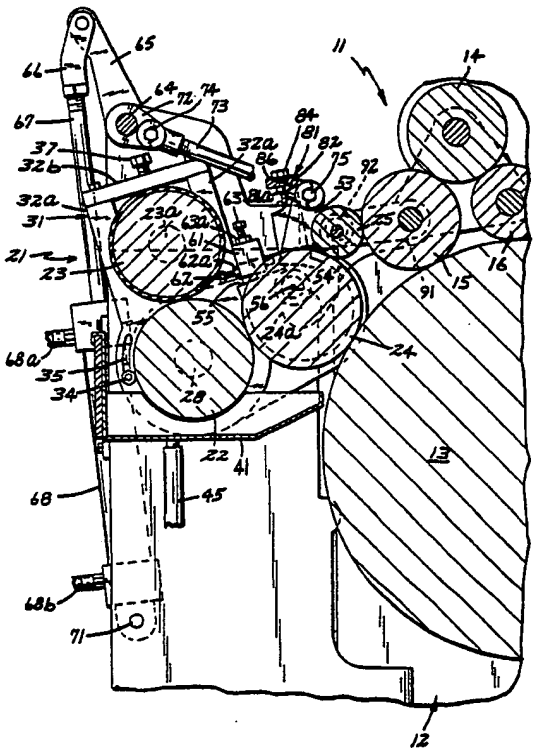
(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).

Published
With international search report.
With amended claims.

(54) Title: DAMPENING UNIT FOR PRINTING PRESS

(57) Abstract

Apparatus (21) for dampening a lithographic plate on the plate cylinder (13) of a lithographic printing press (11). The dampening apparatus has a fluid supply roller (22) mounted for rotation on a first axis and rotatably driven at a predetermined but adjustably variable speed. Water is supplied to the fluid supply roller (22) through a plurality of water jets disposed along its length. A metering roller (23) is mounted for rotation about a second axis parallel to the first axis and disposed in rotatable engagement with the fluid supply roller (22). The metering roller (23) is rotatably driven at a rotational speed different than that of the fluid supply roller (22). A form roller (24) is mounted for rotation about a third parallel axis and is uniformly supplied with ink. The form roller (24) is also driven at a rotational speed different than that of the fluid supply roller (22). The form roller (24) is mounted on a moveable hanger frame (51) that is constructed and arranged to move the form roller (24) first into engagement with the fluid supply roller (22), and then into engagement with the plate cylinder (13).



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DAMPENING UNIT FOR PRINTING PRESS

The invention broadly relates to printing presses and is specifically directed to an improved apparatus for applying dampening fluid to a lithographic printing plate.

Lithographic plates used in offset printing are constructed in such a way that one portion of the lithographic plate (e.g., the portion which is to produce the desired image) is made attractive to ink, while the remaining portion is made ink repellent. A dampening fluid such as water, with or without additives such as alcohol, is applied to the lithographic plate to dampen its nonprinting areas and assist in repelling ink. The application of dampening fluid to the lithographic plate must be precisely controlled to produce optimum results, since excessive or insufficient dampening fluid results in inferior printing.

U.S. Patent No. 3,163,037, which issued to Harold P. Dahlgren on February 2, 1965, discloses an apparatus for dampening lithographic offset printing plates in which physical contact between the lithographic plate and the dampening source is avoided. This permits the dampening fluid to be applied uniformly to the inked lithographic plate without transfer of the ink back to the dampening mechanism. The system utilizes a fluid supply roller which has a metallic, smoothly polished outer surface and is chemically treated to make it water attractive (hydrophilic). This hydrophilic roller rotatably engages one of the ink form rollers of the press in a manner so that the film of dampening fluid on the hydrophilic roller is split, with a portion picked up by the layer of ink on the ink form roller and

transferred to the lithographic plate. The other portion of the dampening fluid is retained on the hydrophilic roller to repel ink, preventing the transfer of ink back into the dampening system.

The subject invention is an improvement of the dampening apparatus disclosed in U.S. Patent No. 3,168,037, and provides a number of structural and functional improvements and features that significantly enhance the dampening operation and thereby improve the quality of printing.

The inventive dampening apparatus utilizes a hydrophilic fluid supply roller that is direct driven by a variable speed motor, and which acts as a pivot point for movement of other rollers in the system. The preferred embodiment utilizes a metering roller that is driven by the hydrophilic roller at a slightly greater rotational speed, but which is in continuous engagement with the hydrophilic roller so that relative slippage or wiping takes place. This results in maintaining a precisely controlled uniform layer or film of water on the hydrophilic roller.

The metering roller is carried in a main hanger frame that pivots about the rotational axis of the hydrophilic roller, permitting the metering roller to move through a limited range of arcuate movement while maintaining driving and roller engagement with the hydrophilic roller.

A dampening form roller is disposed for selective engagement with the hydrophilic roller and lithographic plate cylinder. This is accomplished by mounting the form roller eccentrically on a form roller hanger which is pivotally connected to the main hanger frame. The pivotal connection of the form roller hanger

is spaced from the rotational axis of the form roller so that pivotal swinging movement of the form roller hanger effects limited arcuate movement of the form roller between positions of nonengagement and engagement with the hydrophilic roller. An adjustable limit stop precisely determines the engagement between these two rolls.

An actuator taking the form of a pneumatic cylinder, lever arms and toggle mechanism operates to first move the roller hanger frame to cause engagement of the form roller with the hydrophilic roller. The actuator thereafter causes movement of the main hanger frame to move the form roller into engagement with the lithographic plate cylinder. This engagement is also precisely controlled by an adjustable stop.

A bridge roller is disposed in continuous engagement between an ink roller and the dampening form roller to continuously apply a layer of ink to the form roller. The form roller is rotatably driven by the bridge roller and by the lithographic plate cylinder upon engagement at a speed which is less than the selected rotational speed of the hydrophilic roller.

As constructed, the form roller does not engage either the hydrophilic roller or the lithographic plate cylinder when the printing press is inoperative. Operation of the actuator initially causes the form roller to engage the hydrophilic roller, and the relative rotational velocities result in the "milling" of a precisely controlled layer or film of water onto the form roller. It will be recalled that the layer or film of water on the hydrophilic roller is split, with a portion being retained to repel ink and thus prevent ink from entering the dampening fluid supply.

Further actuation of the actuator causes the form roller to engage the lithographic plate cylinder to apply the precisely controlled water film to the lithographic plate. The water is retained by the nonprinting areas, resulting in optimum printing results.

Causing all motions of the dampening apparatus to be concentric around the fixed hydrophilic roller permits the various rollers to be adjusted much more easily, and at the same time adjustment of one roller will not affect the settings of other rollers. Driving the hydrophilic roller on a fixed rotational axis with a variable speed motor avoids the setting of gears, which is common in prior art structures.

Another significant improvement with the inventive dampening apparatus is the requirement of a single adjustment to set the form roller to the hydrophilic roller in a precise manner, and a single adjustment for setting the form roller to the lithographic plate cylinder in a precise manner.

The toggle mechanism used in the actuator moves to an over center position when the system is operative, thus avoiding problems resulting from fluctuations in air pressure supplied to the pneumatic actuator.

In addition, the bridge roller in the preferred embodiment is mounted by eccentric bushings to insure a proper setting of the bridge roller to the form roller, whether the form roller is in the operative or inoperative position.

Last, water is applied to the hydrophilic roller through a plurality of water jets, rather than the conventional approach of running the roller in a pan of water. This insures that all lint and other debris which might be lifted from the pan is flushed off the hydrophilic roller before such debris can enter the press.

Brief Description of the Drawings

Figure 1 is a view in end elevation of dampening apparatus for a printing press which embodies the invention;

Figure 2 is an enlarged fragmentary sectional view taken along the line 2-2 of Figure 1 showing the apparatus in a first mode of operation;

Figure 3 is an enlarged fragmentary sectional view taken along the line 3-3 of Figure 1 with the apparatus in the first mode of operation;

Figure 4 is an enlarged fragmentary sectional view taken along the line 4-4 of Figure 1 with the apparatus in the first mode of operation;

Figure 5 is a view similar to Figure 3 with the apparatus in a second mode of operation; and

Figure 6 is a view similar to Figure 4 with the apparatus in a second mode of operation.

Description of the Preferred Embodiment

With initial reference to Figures 1-4, a printing press utilizing the inventive dampening apparatus is represented generally by the numeral 11.

Printing press 11 comprises a frame 12 formed from a number of separate components all of which bear the reference numeral 12. A large plate cylinder 13 is mounted to the frame 12 for rotation about a horizontal axis, and is adapted to receive a lithographic plate

(not shown). Ink is fed to the lithographic plate on cylinder 13 through a series of rollers 14-16 that are also rotatably mounted to the frame. The rollers 14-16 are in rotatable engagement with each other and the plate cylinder 13 to distribute ink which is fed from a conventional supply source (not shown) onto the lithographic plate as the plate cylinder 13 is rotated.

With specific reference to Figures 2-4, apparatus for providing a dampening fluid to the lithographic plate is represented generally by the numeral 21. Dampening apparatus 21 comprises a fluid supply or transfer roller 22 the function of which is to receive dampening fluid from a fluid source and to transfer it in metered quantities, a metering roller 23 the function of which is to meter the amount of dampening fluid on supply roller 22, a form roller 24 the function of which is to transfer dampening fluid to the surface of the plate cylinder 13, and a bridge roller 25 the purpose of which is to transfer ink from the ink roller 15 to the form roller 24.

With reference to Figures 1 and 2, fluid supply roller 22 is rotatably mounted about a fixed axis within the frame 12. As such, the position of supply roller 22 within the frame 12 is stationary, although it is capable of rotation. Supply roller 22 is driven by a variable speed motor 20 through a gear reduction box 26, coupling 27 and drive shaft 28 at a desired rotational speed.

Fluid supply roller 22 is generally of the type disclosed in U.S. Patent No. 3,168,037, which issued to Harold P. Dahlgren on February 2, 1965; viz., it is a metallic roller having a smoothly polished surface and is chemically treated so that it is hydrophilic (has an affinity to water).

With reference to Figures 2 and 6, metering roller 23 is rotatably mounted in a main hanger frame bearing the general reference numeral 31. Main hanger frame 31 comprises an upright section 32 and a generally horizontal section 33, the sections 32, 33 being relatively slidable about the drive shaft 28 and secured in a fixed relative position by a nut and bolt 34 disposed in an arcuate slot 35.

The upright section 32 of main hanger frame 31 has spaced legs 32a that slidably receive a rectangular bearing block 36 therebetween. The bearing block 36 has a bearing 36a in which one end of the shaft 23a of metering roller 23 is carried.

A bridge member 32b interconnects the legs 32a and carries an adjustment bolt 37 that projects through and acts as an upper limit stop to the bearing block 36. The bearing block 36 is urged upwardly into engagement with the adjustment bolt 37 by a pair of springs 38 disposed in recesses formed in the hanger section 32.

A main hanger frame 31a which is symmetrically identical to the hanger frame 31 is disposed at the opposite side of printing press 11 to support the other end of the metering roller 23, as well as form roller 24. However, of the two hanger frames 31, 31a, only frame 31 includes the arcuate slot 35 and nut and bolt assembly 34 and portions 32, 33 of frame 31a are of one-piece construction. This permits the relative position of the hanger sections 32, 33 to be adjusted, and accordingly, to skew one end of the metering roller 23 to insure a proper rotational relationship between the rollers 22, 23.

It will be here noted that in the interest of brevity only those components associated with frame 31

on the left side of Figure 1 will hereinafter be described and that similar components associated with frame 31a on the right side of Figure 1 for mounting the other end of rollers 23, 24 will carry similar reference numerals where possible.

With specific reference to Figure 2, a gear 29 is mounted on the drive shaft 28 of hydrophilic roller 22. A slightly smaller gear 39 is mounted on the shaft 23a of metering roller 23, and the two gears 29, 39 meshably engage so that the metering roller 23 is rotated at a slightly faster rotational speed than hydrophilic roller 22. However, and as best shown in Figure 3, the outer cylindrical surfaces of both the rollers 22, 23 engage, and there is a slight wiping action between these surfaces as the metering roller 23 rotates slightly faster.

In the preferred embodiment, the outer surface of metering roller 23 is formed from a layer of rubber or an alternate resilient material suitable for the intended purpose.

With reference to Figures 1 and 5, a longitudinal drip pan 41 is carried by the frame 12 below the hydrophilic roller 23 over its entire length. A dampening fluid, which is preferably water, is applied to the nip between hydrophilic roller 22 and metering roller 23 by a plurality of water jets emanating from a water supply pipe 42 having a plurality of apertures sized and spaced in a desired manner. A pump 43 pumps water into the supply pipe 42 at a desired pressure, and a pump 44 in a drain pipe 45 assists in positively draining water from the drip pan 41 into a waste reservoir 46. It is imperative that the water supplied to hydrophilic roller 22 be clean for optimum printing

results, and the water is recycled through a filter (not shown).

With reference to Figure 4, a form roller hanger for rotatably carrying the form roller 24 is represented generally by the numeral 51. Form roller hanger 51 is of irregular shape, including a somewhat circular body 52 from which an arm member 53 upwardly projects. Planar abutment surfaces 54, 55 are machined into the body 52 at a right angle.

Roller hanger 51 is pivotally mounted to the horizontal section 33 of main hanger frame 31 for free pivotal movement about a pivot axis 56. Form roller 24 has a rotatable shaft 24a mounted in a suitable bearing 57 in the roller hanger body 52. It should be noted that the rotational axis of the roller shaft 24a is spaced from the pivot axis 56, and as such, pivotal movement of the form roller hanger 51 causes the form roller 24 to move eccentrically relative to the pivot axis 56.

With continued reference to Figure 4, a limit stop block 61 is mounted to the upright section 32 of main hanger frame 31. Block 61 carries adjustable limit stop screws 62, 63, which are respectively engageable with the planar abutment surfaces 54, 55. Lock nuts 62a, 63a serve to respectively lock the limit stop screws 62, 63 in desired limit stop positions. The two operational positions of form roller hanger 51, as determined by stop screws 62, 63, are shown in Figures 4 and 6.

The function of limit screw 62 is to prevent counterclockwise rotation of hanger 51 beyond a predetermined limit which defines the inoperational position of form roller 24. Limit stop screw 63 determines

the extent to which form roller hanger 51 may move in a clockwise direction, and hence determines the specific point at which form roller 24 engages hydrophilic roller 22, as described in further detail below.

With reference to Figures 3-6, a horizontal pivot shaft 64 is carried between opposite sides of the frame 12. A long lever arm 65 is secured to the pivot shaft 64 for rotation therewith externally of the frame 12. A pivot link 66 connects the lever arm 65 with the extensible rod 67 of a pneumatic actuator 68. Actuator 68 is pivotally connected to the frame 12 as shown at 71 and includes air supply and exhaust lines 68a, 68b.

A short lever arm 72 is secured to the pivot shaft 64 for rotation therewith, such rotation being substantially coplanar with the limited rotational movement of the form roller hanger 51. A tie rod 73, the length of which is adjustable by threaded end couplings, has one end pivotally connected to the short lever arm 72 by a pivot bolt 74. The opposite end of the tie rod 73 is pivotally connected to the arm member 53 of form roller hanger 51 by a pivot bolt 75.

Short lever arm 72 is angularly positioned on the pivot shaft 64 in a manner so that the tie rod 73 moves through an over center position as the pneumatic actuator 68 moves from a retracted position (Figure 5) to an extended position (Figure 3). In the fully extended position of Figure 3, the tie rod 73 has moved just slightly over center relative to the pivotal connection between the tie rod 73 and hanger arm member 53, and these respective components are therefore locked in the position of Figure 3 even though pressure fluctuations in the air supply to pneumatic actuator 68 may occur.

With the respective components constructed and arranged as shown in the figures, retraction of the pneumatic actuator 68 causes the rollers 22, 23 and 24 to be in the position shown in Figure 5. Hydrophilic roller 22 and metering roller 23 are in rotatable engagement (as they are in all positions of the apparatus), and dampening form roller 24 is in a position of non-engagement with both the plate cylinder 13 and the hydrophilic roller 22. As the pneumatic actuator 68 is extended, the lever arms 65, 72 and tie rod 73 are initially moved from one limit position (Figure 5) to the other limit position (Figure 3), at which time the form roller 24 engages the hydrophilic roller 22. The degree of engagement is precisely determined by the limit stop screw 63.

At the time that the planar abutment surface 55 engages the limit stop screw 63, the pneumatic actuator 68 is only partially extended. Further extension imparts counterclockwise rotational movement of the entire main hanger frame 31 about its pivot axis (the rotational axis of hydrophilic roller 22), and this movement causes the form roller 24 to engage the plate cylinder 13 due to the presence of a limit stop 81 described below.

With reference to Figures 1-3, limit stop 81 specifically comprises an L-shaped member 82 the upright leg of which is secured to the side of main hanger frame 31 by a suitable fastener 83 (Figure 1 only). With reference to Figure 2, the horizontal arm of the member 82 carries a threaded bolt 84 having adjustable lock nuts 84a. A coil spring 85 extends between the end of bolt 84 and a recess in the frame 12.

With reference to Figure 3, the horizontal arm of L-shaped member 82 carries an Allen screw 86 the lower end of which abuts the frame 12 with the pneumatic actuator 68 in its fully extended position. The Allen screw 86 may be adjusted to determine the precise engaging position of the form roller 24 on the plate cylinder 13, and a lock nut 86a secures the Allen screw 86 in the desired position.

With reference to Figures 2 and 3, bridge roller 25 is carried by a bridge roller hanger 91 at each end, the hanger 91 being pivotally carried for swinging movement about the rotational axis of ink roller 15. The hanger 91 carries an eccentric mount 92 having a set screw 93 permitting adjustment of the rotational axis of bridge roller 25 to insure that it uniformly engages the form roller 24 as well as the ink roller 15.

The bridge roller hanger 91 pivots freely about the axis of ink roller 15, permitting the bridge roller 25 to engageably follow the form roller 24 through its range of movement, while also maintaining proper contact with the ink roller 15. As such, bridge roller 25 is in continuous proper engagement with both the ink roller 15 and the form roller 24 notwithstanding extension and retraction of the pneumatic actuator 68.

The bridge roller 25 is oscillated longitudinally (i.e., it moves back and forth along its longitudinal axis of rotation) in a conventional manner by means not shown to better distribute ink on the form roller 24.

In operation, with the pneumatic actuator 68 retracted, the respective components are as shown in Figures 5 and 6. Water is continuously sprayed onto hydrophilic roller 22 by the water supply pipe 42, and

metering roller 23 is in rotatable and wiping engagement with the hydrophilic roller 22 to uniformly control the thickness of the water layer or film on the surface of roller 22. In this position, the form roller 24 is out of engagement with hydrophilic roller 22, but remains in engagement with bridge roller 25. Ink roller 15 is not in contact with plate cylinder 13, as is the conventional practice. As such, the printing press 11 is inoperative.

With a lithographic plate (not shown) mounted on the plate cylinder 13, operation of the press 11 is initiated by causing the pneumatic actuator 68 to move to its extended position. In so doing, form roller 24 initially engages hydrophilic roller 22 as described above, with contact properly established by adjustment of the limit stop screw 63.

Prior to engagement with the hydrophilic roller 22, form roller 24 has been rotatably driven by its engagement with oscillating bridge roller 25, and as a result has a uniform layer of ink over its surface. Upon engagement with the hydrophilic roller 22, a layer or film of water is "milled" onto the form roller 24 by the hydrophilic roller 22, which rotates at a greater speed. Having received a layer of water from hydrophilic roller 22, the form roller 24 is now ready for engagement with the plate cylinder 13. Further extension of the pneumatic actuator 68 causes the form roller 24 to engage the plate cylinder 13 as described above, with precise contact determined by setting of the Allen screw 86. At this time, the form roller 24 immediately applies water to the lithographic plate on plate cylinder 13 in a precisely controller proper amount. This engagement is shown in Figures 1-4, which also show

the ink roller in rolling engagement with the lithographic plate of plate cylinder 13.

When the pneumatic actuator 68 is retracted to the inoperative position, form roller 24 first leaves engagement with the plate cylinder 13, and thereafter leaves engagement with the hydrophilic roller 22.

As described, the dampening apparatus is capable of uniformly applying water to the lithographic plate in precisely controlled quantities, which produces optimum printing results, while at the same time avoiding undesirable intermixture of excessive quantities of ink and water, which results in emulsification and poorer printing results.

What is claimed is:

1. Apparatus for dampening a lithographic plate on a printing press plate cylinder, comprising:

frame means;

first hanger means mounted to the frame means for pivotal movement between first and second positions about a first pivot axis;

a fluid supply roller carried by the first hanger means for rotation about a first axis coinciding with said first pivot axis;

first drive means for driving the fluid supply roller at a selected rotational speed;

means for supplying dampening fluid to the fluid supply roller over substantially its entire length;

a metering roller carried by the first hanger means for rotation about a second axis in rotating engagement with the fluid supply roller;

second drive means for driving the metering roller at a rotational speed different than that of the fluid supply roller;

second hanger means mounted to the first hanger means for pivotal movement between first and second positions about a second pivot axis;

a dampening form roller carried by the second hanger means for rotation about a third axis spaced from said second pivot axis;

third drive means for driving the dampening form roller at a rotational speed different than that of the fluid supply roller;

the fluid supply and form rollers and said first and second hanger means being constructed and arranged so that the dampening form roller moves into rotational engagement with the fluid supply roller when the second hanger means is moved from its first position to its second position, and for moving the form roller into engagement with the plate cylinder when the first hanger means is moved from its first position to its second position;

and actuator means for sequentially moving the second hanger means from its first to its second position, and the first hanger means from its first position to its second position, whereby the dampening form roller first engages the fluid supply roller and then engages the printing press plate cylinder.

2. The apparatus defined by claim 1, which further comprises adjustable stop means for adjustably limiting movement of the first hanger means beyond its second position, whereby engagement of the form roller with the plate cylinder is precisely controlled.

3. The apparatus defined by claim 1 or 2, which further comprises adjustable stop means for adjustably limiting movement of the second hanger means beyond its second position, whereby engagement of the form roller with the fluid supply roller is precisely controlled.

4. The apparatus defined by claim 1, wherein the first drive means comprises variable speed motor means.

5. The apparatus defined by claim 1, wherein the means for supplying dampening fluid is constructed and arranged to spray dampening fluid on the fluid supply roller in a plurality of fluid jets.

6. The apparatus defined by claim 5, wherein the means for supplying dampening fluid comprises a pipe disposed adjacent to and in substantial parallel relationship to the fluid supply roller, the pipe having a plurality of spaced apertures facing the fluid supply roller, and being adapted for connection to a source of dampening fluid under pressure.

7. The apparatus defined by claim 1, wherein the dampening fluid is water.

8. The apparatus defined by claim 1, wherein the external surface of the fluid supply roller is hydrophilic.

9. The apparatus defined by claim 1 or 8, wherein the external surfaces of the form and metering rollers are resilient.

10. The apparatus defined by claim 1, wherein the second drive means comprises first and second intermeshing gears respectively mounted on the fluid supply and metering rollers.

11. The apparatus defined by claim 1, wherein the second drive means is constructed and arranged to drive the metering roller at a rotational speed greater than that of the fluid supply roller.

12. The apparatus defined by claim 1, which further comprises means for adjustably skewing one of said fluid supply and metering rollers relative to the other.

13. The apparatus defined by claim 1, which further comprises means for uniformly applying ink to the form roller.

14. The apparatus defined by claim 13, wherein the ink applying means comprises an ink transfer roller mounted for rotation about a fourth axis and disposed in rolling engagement with the form roller.

15. The apparatus defined by claim 14, which further comprises third hanger means for mounting the transfer roller.

16. The apparatus defined by claim 15, which further comprises an ink roller mounted for rotation about a fifth axis and disposed in engagement with the transfer roller, said third hanger means being mounted for pivotal movement about a third pivot axis that coincides with said fifth axis.

17. The apparatus defined by claim 16, wherein the third hanger means comprises adjustable eccentric bearing means for adjusting the rotational axis of the ink transfer roller relative to said fifth axis.

18. The apparatus defined by claim 14, wherein the third drive means comprises said ink transfer roller.

19. The apparatus defined by claim 1, wherein the third drive means comprises said plate cylinder.

20. The apparatus defined by claim 1, wherein the third drive means is constructed and arranged to rotate the form roller at a rotational speed less than that of the fluid supply roller.

21. The apparatus defined by claim 1, wherein the actuator means comprises toggle means for locking the first and second hanger means in said respective second positions.

22. The apparatus defined by claim 21, wherein the actuator means comprises:

a fluid cylinder movable between extended and retracted positions;

lever means operatively connected to the fluid cylinder;

tie rod means pivotally connected between said lever means and said second hanger means;

said lever means and said second hanger means being constructed and arranged so that the tie rod means moves to an over center position when the second hanger means is moved from the first position to the second position.

23. Apparatus for dampening a lithographic plate on the plate cylinder of a printing press, comprising:

a fluid supply roller mounted for rotation about a first rotational axis;

first drive means for driving the fluid supply roller at a predetermined rotational speed;

means for supplying dampening fluid to the fluid supply roller;

a metering roller mounted for rotation about a second rotational axis and disposed in rotatable engagement with the fluid supply roller;

second drive means for driving the metering roller at a rotational speed different than that of the fluid supply roller;

a form roller mounted for rotation about a third rotational axis;

means for uniformly applying ink to the form roller;

third drive means for driving the form roller at a rotational speed different than that of the fluid supply roller;

means for carrying the form roller for movement into and out of engagement with the fluid supply roller, and for movement into and out of engagement with the plate cylinder;

and actuator means for moving the form roller first into engagement with the fluid supply roller, and for then moving the form roller into engagement with the plate cylinder.

AMENDED CLAIMS
[received by the International Bureau on 06 March 1986 (06.03.86);
new claims 24–39 (5 pages)]

24. (New) In an apparatus for dampening a lithographic plate on a printing press cylinder, including a fluid supply roller, means for supplying dampening fluid to the fluid supply roller, a metering roller disposed in rotatable engagement with the fluid supply roller and a form roller to which ink is supplied, the improvement which comprises:

means for moving the form roller into and out of engagement with the fluid supply roller, and for movement into and out of engagement with the plate cylinder;

and actuator means for moving the form roller first into engagement with the fluid supply roller, and for then moving the form roller into engagement with the plate cylinder.

25. (New) The apparatus defined by claim 24, wherein the improvement further comprises means for rotating the metering roller at a rotational speed different than that of the fluid supply roller.

26. (New) The apparatus defined by claim 25, where the metering roller is rotated at a faster rotational speed than that of the fluid supply roller.

27. (New) The apparatus defined by claim 24, wherein the improvement further comprises means for rotating the form roller at a rotational speed different than the rotational speed of the fluid supply roller.

28. (New) The apparatus defined by claim 27, wherein the form roller is rotated at a slower rotational speed than the fluid supply roller.

29. (New) The apparatus defined by claim 24, wherein the improvement further comprises spray means for supplying said dampening fluid to the fluid supply roller in a plurality of fluid jets.

30. (New) The apparatus defined by claim 24, wherein the actuator means includes toggle means for creating an overcenter locking force on said form roller when it is in engagement with said plate cylinder.

31. (New) The apparatus defined by claim 30, wherein the toggle means includes adjustment means for selectively determining the overcenter locking force on said form roller.

32. (New) The apparatus defined by claim 24, wherein the actuator means further comprises adjustment means for selectively determining the engagement force of said form roller when it engages said fluid supply roller.

33. (New) In an apparatus for dampening a lithographic plate on a printing press cylinder, including a fluid supply roller, means for supplying dampening fluid to the fluid supply roller, a metering roller disposed in rotatable engagement with the fluid supply roller and a form roller to which ink is supplied, the improvement which comprises:

means for moving the form roller into and out of engagement with the fluid supply roller, and for movement into and out of engagement with the plate cylinder;

and actuator means for moving the form roller into engagement with the fluid supply roller and said plate cylinder, said actuator means including toggle means for creating an overcenter locking force on said form roller when it is in engagement with said plate cylinder.

34. (New) The apparatus defined by clam 33, wherein the toggle means includes adjustment means for selectively determining the overcenter locking force on said form roller.

35. (New) The apparatus defined by claim 33 or 34, wherein the actuator means further comprises adjustment means for selectively determining the engagement force of said form roller when it engages said fluid supply roller.

36. (New) Apparatus for dampening a lithographic plate on the plate cylinder of a printing press, comprising:

a fluid supply roller mounted for rotation about a first rotational axis;

means for supplying dampening fluid to the fluid supply roller;

a metering roller mounted for rotation about a second rotational axis and disposed in rotatable engagement with the fluid supply roller;

a form roller mounted for rotation about a third rotational axis;

means for uniformly applying ink to the form roller;

first drive means for driving the fluid supply roller at a predetermined rotational speed;

and second drive means for driving the metering roller at a rotational speed greater than that of the fluid supply roller.

37. (New) Apparatus for dampening a lithographic plate on the plate cylinder of a printing press, comprising:

a fluid supply roller mounted for rotation about a first rotational axis;

means for supplying dampening fluid to the fluid supply roller;

a metering roller mounted for rotation about a second rotational axis, the metering roller being disposed in rotatable engagement with the fluid supply roller and defining a first line of contact therewith;

a form roller mounted for rotation about a third rotational axis, the form roller being disposed in rotatable engagement with the fluid supply roller and defining a second line of contact therewith;

said first and second lines of contact being spaced apart on said fluid supply roller a distance which subtends an angle no more than about 80° thereon.

38. (New) Apparatus for dampening a lithographic plate on the plate cylinder of a printing press, comprising:

a fluid supply roller mounted for rotation about a first rotational axis, the fluid supply roller having a hydrophilic external surface;

first drive means for driving the fluid supply roller at a predetermined rotational speed;

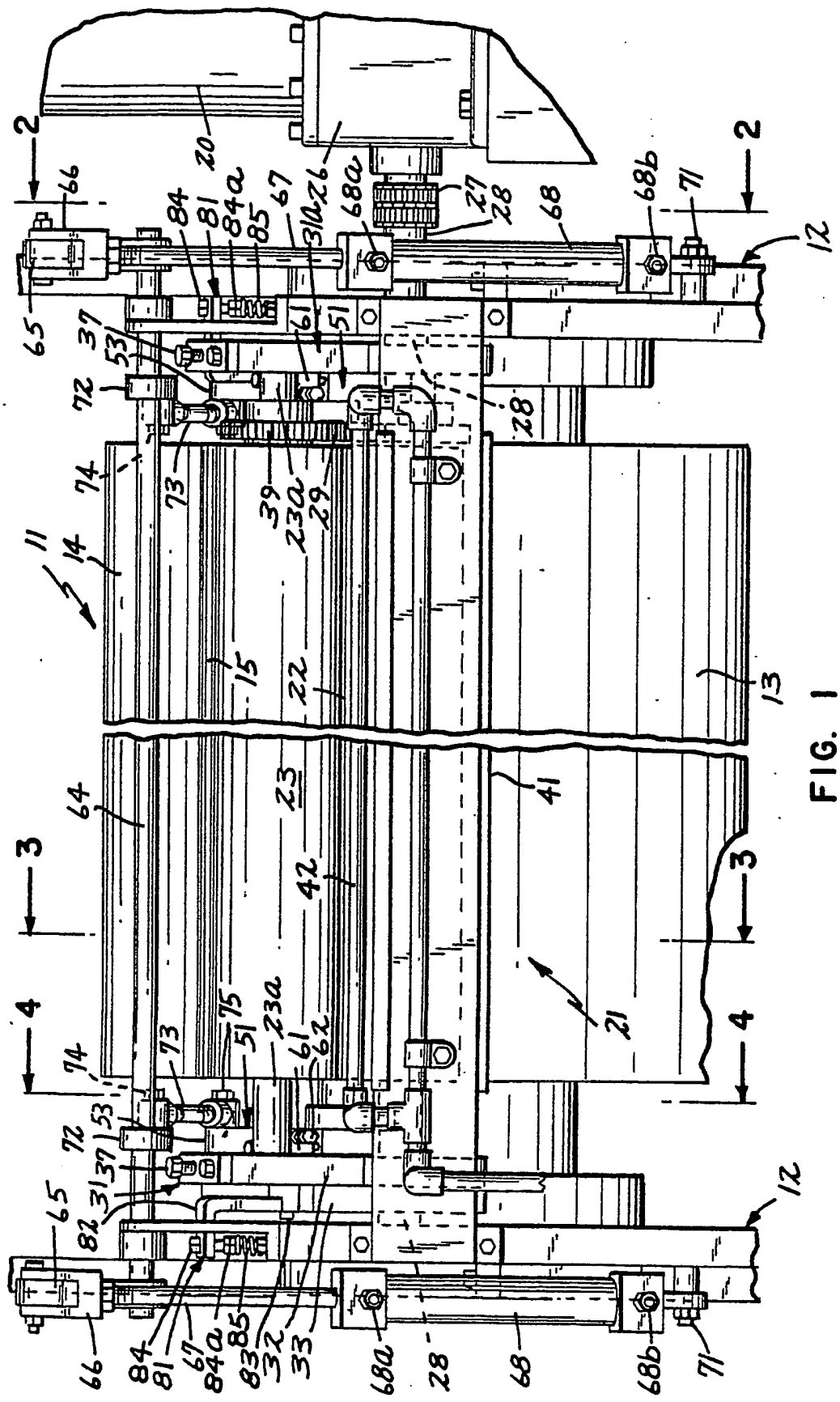
a metering roller mounted for rotation about a second rotational axis and disposed in rotatable engagement with the fluid supply roller;

second drive means for driving the metering roller at a predetermined rotational speed;

a form roller mounted for rotation about a third rotational axis and disposed for rotatable engagement with the fluid supply roller and the plate cylinder;

and spray means for continuously and directly spraying dampening fluid over the length of the fluid supply roller proximate its region of engagement with the metering roller.

39. (New) The apparatus defined by claim 38, which further comprises drain pan means disposed below the fluid supply roller for collecting residual water from the fluid supply roller, and means associated with the drain pan means and spray means for filtering and recycling the collected residual water.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23a
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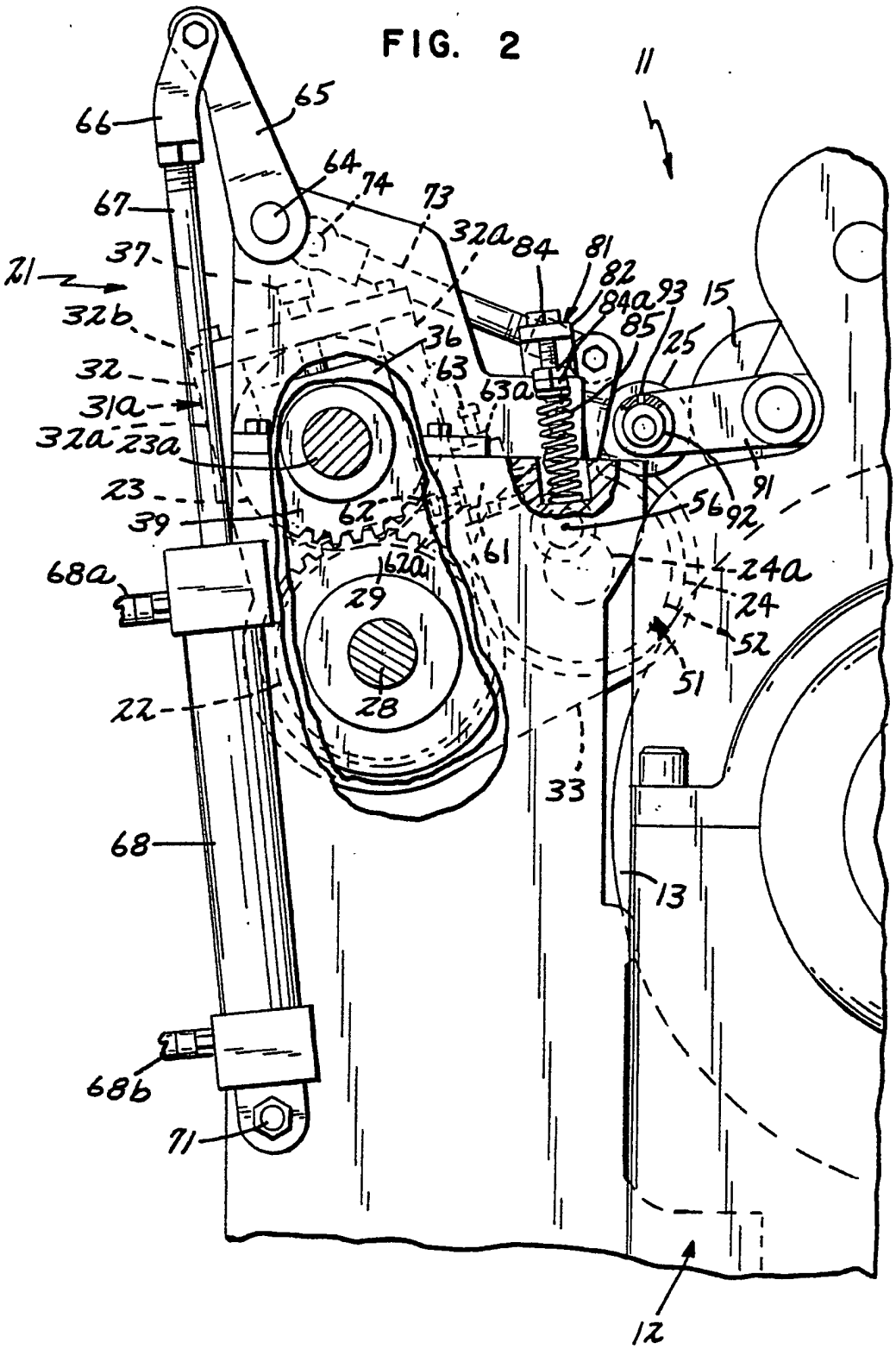
FIG. 1

FIG. 2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63a
31a
32a
23a
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92
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68a
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FIG. 3

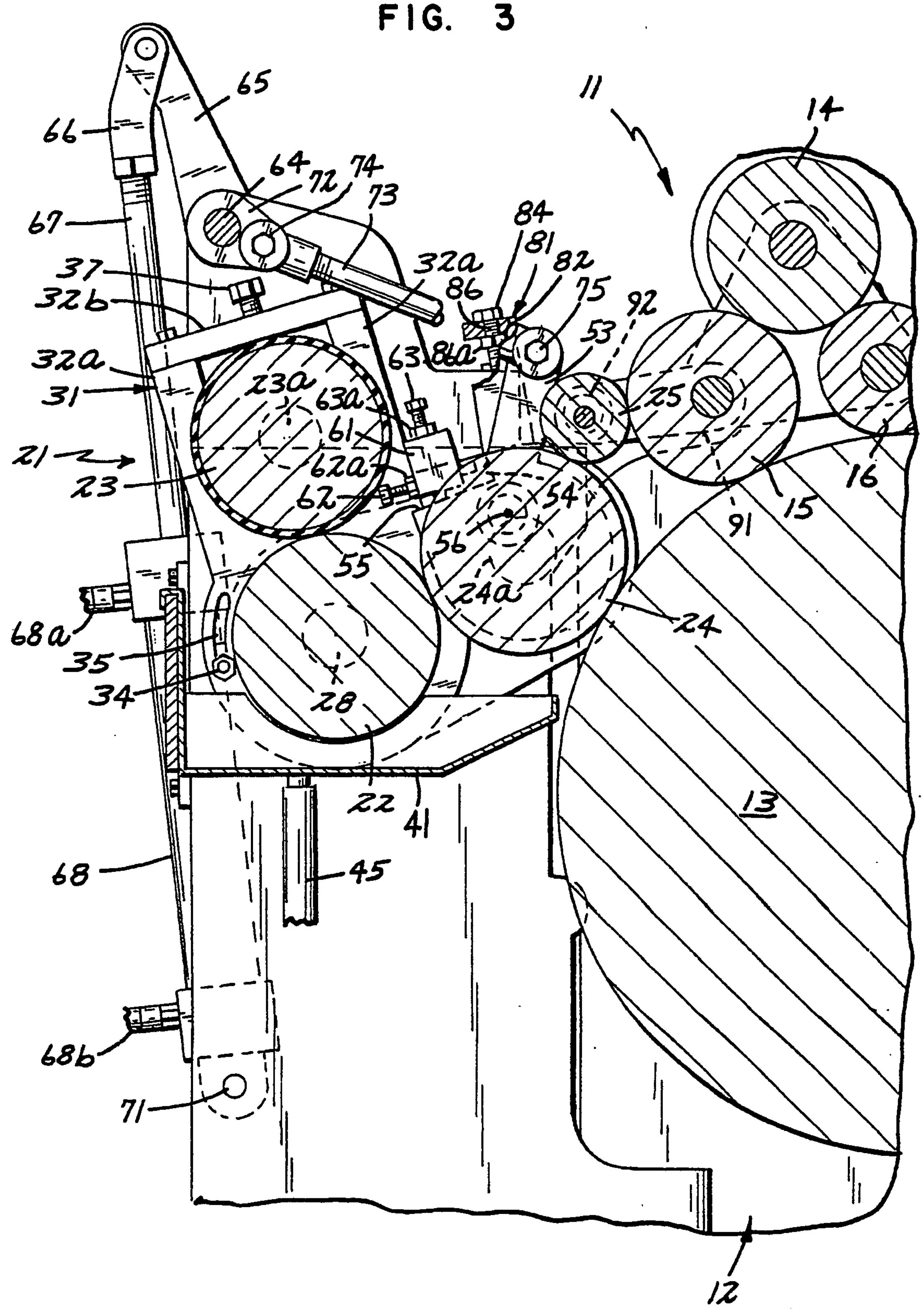
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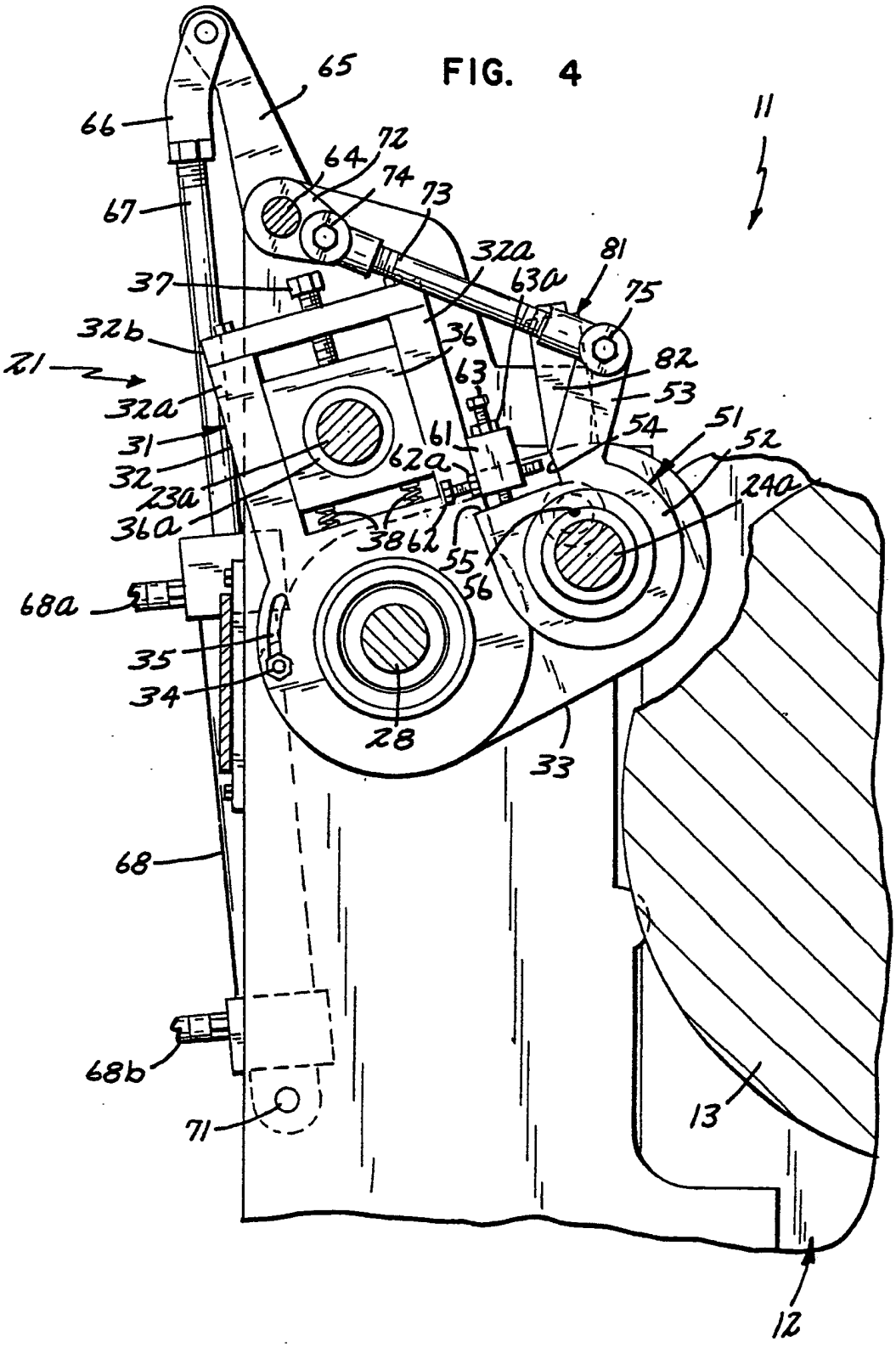
FIG. 4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62a
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23a
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36a
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FIG. 5

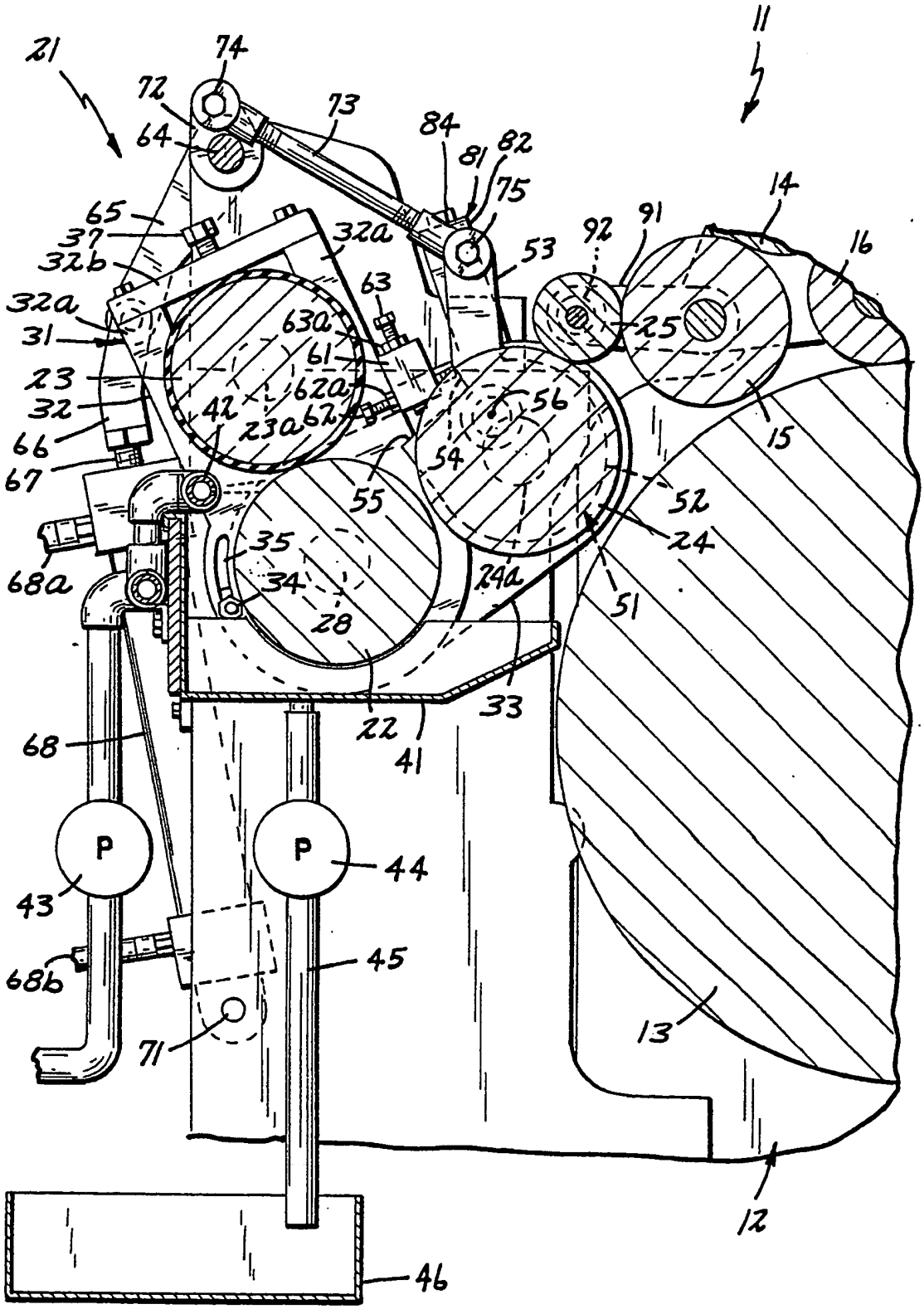
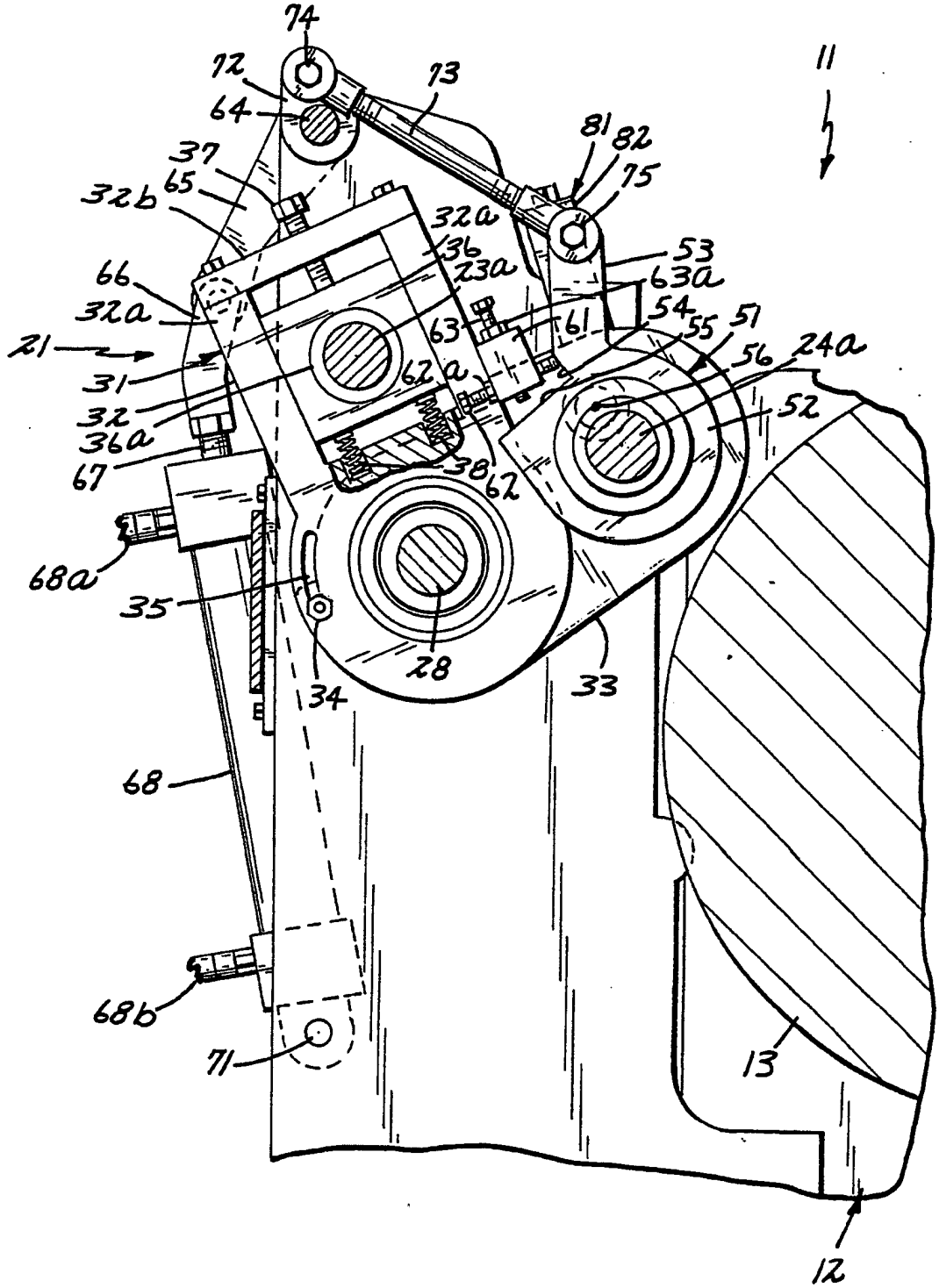


FIG. 6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INTERNATIONAL SEARCH REPORT

International Application No PCT/US85/01971

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[4] B41L 25/12; B41L 25/16
U.S. Cl. 101/147

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S	101/147

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	US, A 1,462,136 Henderson 17 July 1923	1-23
A	US, A 1,472,626 Blaine 30 October 1923	1-23
A	US, A 2,231,694 Stevens 11 February 1941	1-23
A	US, A 2,233,210 Huck 25 February 1941	1-23
A	US, A 2,320,523 Jirousek 1 June 1943	1-23
A	US, A 2,570,242 James 9 October 1951	1-23
A	US, A 2,915,970 Mestre 8 December 1959	1-23
A	US, A 3,168,037 Dahlgren 2 February 1965	1-23
A	US, A 3,259,062 Dahlgren 5 July 1966	1-23
A	US, A 3,261,287 Brodie 19 July 1966	1-23
A	US, A 3,283,707 Greubel 8 November 1966	1-23
A	US, A 3,343,484 Dahlgren 26 September 1967	1-22

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [3]	Date of Mailing of this International Search Report [3]
27 November 1985	06 JAN 1986
International Searching Authority [1]	**Signature of Authorized Officer [20]**
ISA/US	William L. Klima

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

X,Y	US, A 3,343,484 Dahlgren 26 September 1961	23
A	US, A 3,352,317 Dahlgren 14 November 1967	1-23
A	US, A 3,404,625 White 8 October 1968	1-22
Y	US, A 3,404,625 White 8 October 1968	23
A	US, A 3,507,215 Schumann 21 April 1970	1-23
A	US, A 3,603,254 Sieble 7 September 1971	1-22
Y	US, A 3,603,254 Sieble 7 September 1971	23

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [10]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers _____, because they relate to subject matter [12] not required to be searched by this Authority, namely:

2. ☐ Claim numbers _____, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out [13], specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [11]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No [18]
A	US, A 3,647,525 Dahlgren 7 March 1972	1-23
A	US, A 3,673,959 Jezuit 4 July 1972	1-23
A	US, A 3,688,694 Preuss 5 September 1972	1-23
A	US, A 9,705,451 Dahlgren 12 December 1972	1-23
A	US, A 3,744,414 Krochert 10 July 1973	1-23
A	US, A 3,749,011 Abendroth 31 July 1973	1-23
A	US, A 3,911,815 Banfer 14 October 1975	1-23
A	US, A 3,937,141 Dahlgren 10 February 1976	1-23
A	US, A 3,986,452 Dahlgren 19 October 1976	1-23
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A	US, A 4,233,898 Dahlgren 18 November 1980	1-23
A	US, A 4,290,359 Kapoor 22 September 1981	1-22
Y	US, A 4,290,359 Kapoor 22 September 1981	23
A	US, A 4,351,236 Beisel 28 September 1981	1-23
A	US, A 4,365,552 Kubert 28 September 1981	1-23
A	US, A 4,385,559 Jarach 28 December 1982	1-23
A	US, A 4,440,081 Beisel 3 April	1-23
A,P	US, A 4,481,882 Rudolph 13 November 1984	1-23

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